Missile Components

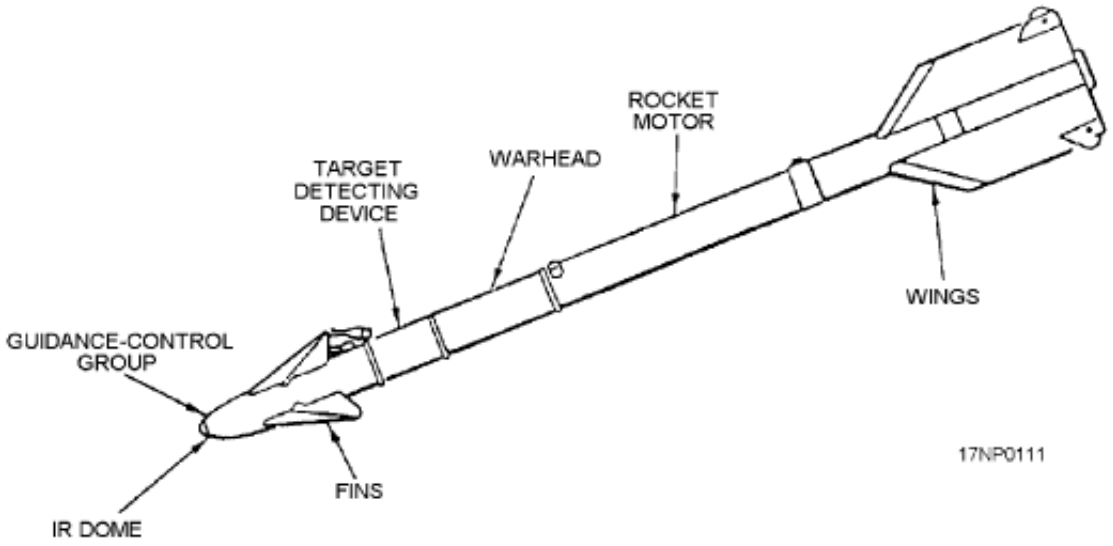
MISSILE COMPONENTS

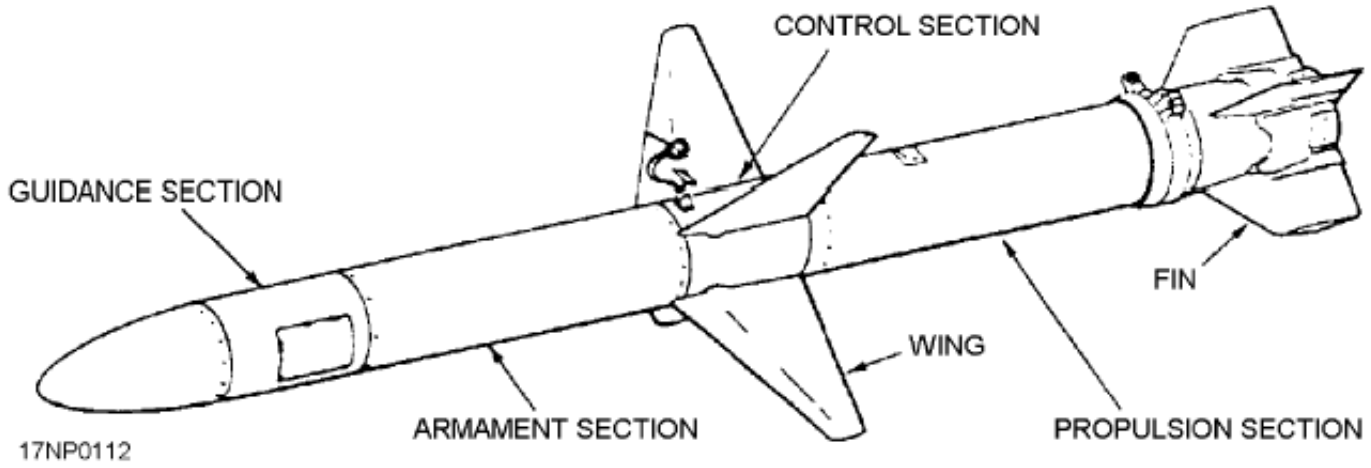
Guided missiles are made up of a series of subassemblies. The various subassemblies form a major section of the overall missile to operate a missile system, such as guidance, control, armament (warhead and fuzing), and propulsion. The major sections are carefully joined and connected to each other. They form the complete missile assembly. The arrangement of major sections in the missile assembly varies, depending on the missile type.

The guidance section is the brain of the missile. It directs its maneuvers and causes the maneuvers to be executed by the control section. The armament section carries the explosive charge of the missile, and the fuzing and firing system by which the charge is exploded. The propulsion section provides the force that propels the missile.

Guidance and Control Section

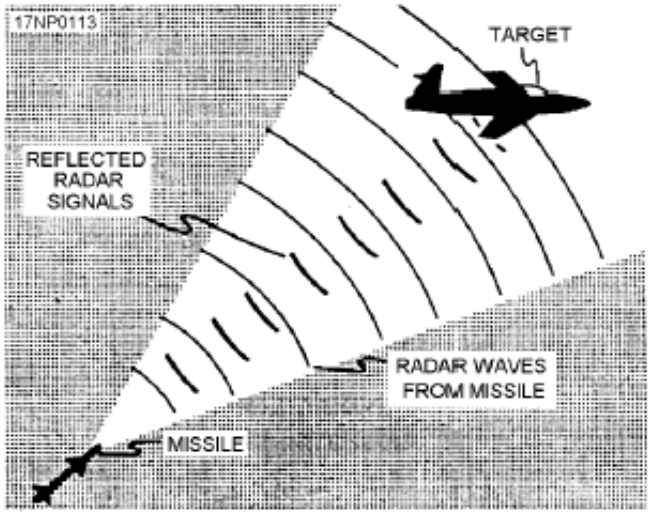
The complete missile guidance system includes the electronic sensing systems that initiate the guidance orders and the control system that carries them out. The elements for missile guidance and missile control can be housed in the same section of the missile, or they can be in separate sections.



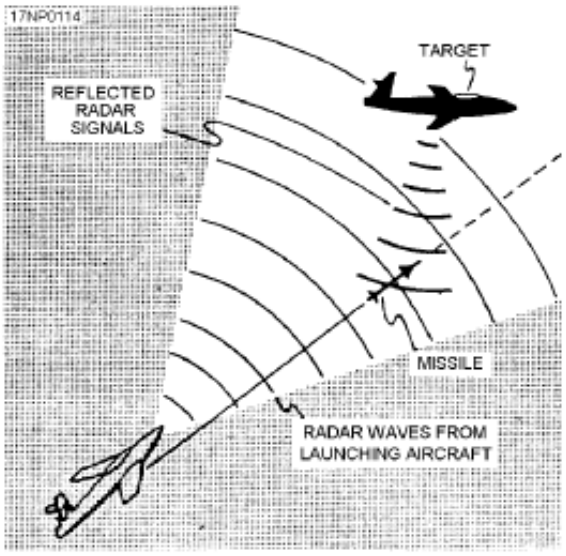


There are a number of basic guidance systems used in guided missiles. Homing-type, air-launched, guided missiles are currently used. They use radar or infrared homing systems. A homing guidance system is one in which the missile seeks out the target, guided by some physical indication from the target itself. Radar reflections or thermal characteristics of targets are possible physical influences on which homing systems are based. Homing systems are classified as active, semiactive, and passive.

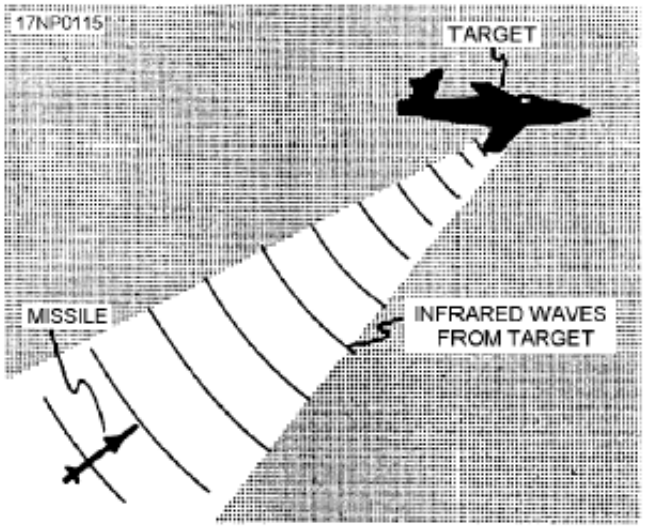
ACTIVE.ï¿½In the active homing system, target illumination is supplied by a component carried in the missile, such as a radar transmitter. The radar signals transmitted from the missile are reflected off the target back to the receiver in the missile. These reflected signals give the missile information such as the target's distance and speed. This information lets the guidance section compute the correct angle of attack to intercept the target. The control section that receives electronic commands from the guidance section controls the missileï¿½s angle of attack. Mechanically manipulated wings, fins, or canard control surfaces are mounted externally on the body of the weapon. They are actuated by hydraulic, electric, or gas generator power, or combinations of these to alter the missile's course.



SEMIACTIVE.ï¿½In the semiactive homing system, the missile gets its target illumination from an external source, such as a transmitter carried in the launching aircraft. The receiver in the missile receives the signals reflected off the target, computes the information, and sends electronic commands to the control section. The control section functions in the same manner as previously discussed.



PASSIVE.ï¿½In the passive homing system, the directing intelligence is received from the target. Examples of passive homing include homing on a source of infrared rays (such as the hot exhaust of jet aircraft) or radar signals (such as those transmitted by ground radar installations). Like active homing, passive homing is completely independent of the launching aircraft. The missile receiver receives signals generated by the target and then the missile control section functions in the same manner as previously discussed.



Armament Section

The armament system contains the payload (explosives), fuzing, safety and arming (S&A) devices, and target-detecting devices (TDDs).

PAYLOAD.ï¿½The payload is the element or part of the missile that does what a particular missile is launched to do. The payload is usually considered the explosive charge, and is carried in the warhead of the missile. High-explosive warheads used in air-to-air guided missiles contain a rather small explosive charge, generally 10 to 18 pounds of H-6, HBX, or PBX high explosives. The payload contained in high-explosive warheads used in air-to-surface guided missiles varies widely, even within specific missile types, depending on the specific mission. Large payloads, ranging up to 450 pounds, are common. Comp B and H-6 are typical explosives used in a payload. Most exercise warheads used with guided missiles are pyrotechnic signaling devices. They signal fuze functioning by a brilliant flash, by smoke, or both. Exercise warheads frequently contain high explosives, which vary from live fuzes and boosters to self-destruct charges that can contain as

much as 5 pounds of high explosive.

FUZING.ï¿½The fuzing and firing system is normally located in or next to the missile's warhead section. It includes those devices and arrangements that cause the missile's payload to function in proper relation to the target. The system consists of a fuze, a safety and arming (S&A) device, a target-detecting device (TDD), or a combination of these devices. There are two general types of fuzes used in guided missilesï¿½proximity fuzes and contact fuzes. Acceleration forces upon missile launching arm both fuzes. Arming is usually delayed until the fuze is subjected to a given level of accelerating force for a specified amount of time. In the contact fuze, the force of impact closes a firing switch within the fuze to complete the firing circuit, detonating the warhead. Where proximity fuzing is used, the firing action is very similar to the action of proximity fuzes used with bombs and rockets.

SAFETY AND ARMING (S&A) DEVICES.ï¿½ S&A devices are electromechanical, explosive control devices. They maintain the explosive train of a fuzing system in a safe (unaligned) condition until certain requirements of acceleration are met after the missile is fired.

TARGET-DETECTING DEVICES (TDD).ï¿½ TDDs are electronic detecting devices similar to the detecting systems in VT fuzes. They detect the presence of a target and determine the moment of firing. When subjected to the proper target influence, both as to magnitude and change rate, the device sends an electrical impulse to trigger the firing systems. The firing systems then act to fire an associated S&A device to initiate detonation of the warhead. Air-to-air guided missiles are normally fuzed for a proximity burst by using a TDDwith an S&A device. In some cases, a contact fuze may be used as a backup. Air-to-surface guided missile fuzing consists of influence (proximity) and/or contact fuzes. Multifuzing is common in these missiles.

Propulsion Section

Guided missiles use some form of jet power for propulsion. There are two basic types of jet propulsion power plants used in missile propulsion systemsï¿½the atmospheric (air-breathing) jet and the thermal jet propulsion systems. The basic difference between the two systems is that the atmospheric jet engine depends on the atmosphere to supply the oxygen necessary to start and sustain burning of the fuel. The thermal jet engine operates independently of the atmosphere by starting and sustaining combustion with its own supply of oxygen contained within the missile.

ATMOSPHERIC JET PROPULSION SYSTEM.

ï¿½There are three types of atmospheric jet propulsion systemsï¿½the turbojet, pulsejet, and ramjet engines. Of these three systems, only the turbojet engine is currently being used in Navy air-launched missiles. A typical turbojet engine includes an air intake, a mechanical compressor driven by a turbine, a combustion chamber, and an exhaust nozzle. The engine does not require boosting and can begin operation at zero acceleration.

THERMAL JET PROPULSION SYSTEM

Thermal jets include solid propellant, liquid propellant, and combined propellant systems. As an AO, you come in contact with all three systems. The solid propellant and combined propellant systems are currently being used in some air-launched guided missiles. The majority of air-launched guided missiles used by the Navy use the solid propellant rocket motor. They include the double base and multibase smokeless powder propellants as well as the composite mixtures. Grain configurations vary with the different missiles. Power characteristics and temperature limitations of the individual rocket motors also vary. In some guided missiles, different thrust requirements exist during the boost phase as compared to those of the sustaining phase. The

dual thrust rocket motor (DTRM) is a combined system that contains both of these elements in one motor. The DTRM contains a single propellant grain made of two types of solid propellantï¿½boost and sustaining. The grain is configured so the propellant meeting the requirements for the boost phase burns at a faster rate than the propellant for the sustaining phase. After the boost phase propellant burns itself out, the sustaining propellant sustains the motor in flight over the designed burning time (range of the missile).